

## SLIDE FASTENER WITH SEPARABLE BOTTOM END STOP

### BACKGROUND OF THE INVENTION

#### Field of the Invention

The present invention relates to a configuration of a reinforcement portion for reinforcing a fastener tape located beside a box pin or an insert pin attached to an end portion of the fastener tape in a separable bottom stop end provided on a slide fastener.

#### Description of the Related Art

In recent years, provision of a product having a simplified structure, which realizes a cheap price and excellent quality, has been demanded by the slide fastener field in the market. This tendency is remarkably apparent in a slide fastener with a separable bottom end stop which is used in an opening/closing section in the front body of clothes and capable of connecting or disconnecting end portions of fastener tapes.

Conventionally, in an ordinary product of the slide fastener with the separable bottom end stop, fastener elements are attached along opposing side edges of a pair of fastener tapes and separable bottom end stops each constituted of a box pin, a box and an insert pin are attached to the bottom end of the fastener elements. Then, a reinforcement tape in which an adhesive layer is provided on the rear face of a plain woven fabric (taffeta) or synthetic resin film is bonded to the

fastener tape at a portion to be provided with the separable bottom stop end in order to reinforce the portion for stabilization and then, the separable bottom stop end is attached.

The slide fastener with separable bottom stop end having the reinforcement tape requires the reinforcement tape in order to reinforce the fastener tape so that the quantity of components of the slide fastener increases thereby increasing product cost. Further, because a step of bonding the reinforcement tape and a bonding machine are always required in a process for manufacturing the slide fastener and thus, the manufacturing process cannot be simplified, an increase in product cost is induced.

On the other hand, for example, UK Patent No. 988659 has disclosed a separable bottom end stop for a slide fastener in which the separable bottom end stop and a reinforcement portion having plural ribs are formed integrally with the both the front and rear faces of a fastener tape using synthetic resin without attaching a reinforcement tape to the end portion of the fastener tape.

Although in this slide fastener with the separable bottom end stop disclosed in this publication, its rib is permitted to be formed into any shape in its section, no improvement about a collision between the rib and a sewing needle which may occur at the time of sewing on a sewing object such as clothes is

achieved. Consequently, the frequency that the rib may be damaged by a strike with the sewing needle is high and the damaged portion may be protruded from a matching portion between the fastener tape and the object clothes, thereby possibly injuring the skin of a wearer.

The present invention has been achieved in views of the above-described problem and a first object of the present invention is to improve the way for sewing a slide fastener with a separable bottom end stop on a sewing object such as clothes and specifically, to provide a slide fastener with a separable bottom end stop which enables itself to be sewed easily and securely and is capable of preventing a reinforcement portion from being damaged by a collision between a sewing needle and ribs and allows a separation operation of the separable bottom end stop to be carried smoothly.

In addition to the above object, a second object of the present invention is to provide the slide fastener with the separable bottom end stop which, even if the sewing needle makes contact with the rib in the reinforcement portion at the time of sewing, deflects the sewing needle from the rib effectively so as to sew the slide fastener onto a sewing object securely, thereby ensuring an excellent texture to the skin.

In addition to the above objects, a third object of the present invention is to provide the slide fastener with the separable bottom end stop capable of sewing the reinforcement

portion securely and effectively without any trouble at the time of sewing. A fourth object of the present invention is to provide the slide fastener with the separable bottom end stop in which the rib of the reinforcement portion has an ideal slope thereby preventing the rib from being damaged by a sewing needle at the time of sewing and capable of sewing the rib of the reinforcement portion smoothly.

A fifth object of the present invention is to provide the slide fastener with the separable bottom end stop which, if the sewing line is apart from an opening, enables a large size slide fastener to be sewed appropriately and effectively.

A sixth object of the present invention is to provide the slide fastener with the separable bottom end stop which, if the sewing line is in the vicinity of an opening, enables a small size slide fastener to be sewed appropriately and effectively.

A seventh object of the present invention is to provide the slide fastener with the separable bottom end stop in which the ribs of the reinforcement portions are provided symmetrically on both the front and rear faces of the fastener tape so as to enable sewing from any sides thereby preventing the ribs from being damaged by a collision of the sewing needle.

#### SUMMARY OF THE INVENTION

According to the present invention, to achieve the above object, fastener elements are attached to opposing side edges

of a pair of the fastener tapes and there are provided a separable bottom end stop made of synthetic resin, for example, a box pin, a box and an insert pin, which is attached by integral molding to the side edge of the fastener tape at an end portion of the fastener elements, and a reinforcement portion formed integrally with the separable bottom end stop such that they are exposed on at least one face of the fastener tape in order to reinforce the fastener tape. The reinforcement portions are formed of plural ribs connected to the separable bottom end stop. The ribs are formed at a sewing position to an sewing object, for example, clothes, such that its height  $H$  is 0.5 to 0.85 mm and its width  $W$  is 0.6 to 0.9 mm and that they are expanded gradually from a vertex to the base portion. There is provided a gap portion wider than the base portion of the rib between the ribs. Consequently, this slide fastener with the separable bottom end stop enables the reinforcement portion constituted of the ribs to be sewed easily and effectively.

In addition to this configuration, the ribs at the sewing position in the reinforcement portion are provided with a chamfering portion whose vertex is chamfered and preferably, this chamfering portion is formed into an arc-like configuration in which the radius of its lateral sectional shape is 0.05 to 0.1 mm.

Further, in addition to the basic configuration of the present invention, the size of the gap portion formed between

the adjacent ribs at the sewing position in the reinforcement portion is preferred to be 2.0 to 2.5 mm and the respective ribs are preferred to be disposed in parallel in the width direction of the fastener tape.

In addition to the above-described basic configuration, the ribs at the sewing position in the reinforcement portion is preferred to satisfy the condition in which  $\tan\theta = H/(W/2)$ , which is an degree of an inclination of the rib on its base portion, is from 1.1 to 2.9. That is, the inclination angle  $\theta$  of the rib on its base portion, which is disposed at the sewing position in the reinforcement portion, is preferred to be in a range of  $55^\circ$  to  $70^\circ$ .

Furthermore, in addition to the above-described configuration, the ribs at the sewing position in the reinforcement portion is preferred to be disposed on the side face of the separable bottom end stop, attached to the side edge of the fastener tape, through an auxiliary member formed in a flat shape or in various kinds of shapes.

Moreover, the ribs at the sewing position in the reinforcement portion may be disposed on the side face of the separable bottom end stop, attached to the side edge of the fastener tape, directly not through any auxiliary member. The ribs at the sewing position in the reinforcement portion may be disposed symmetrically on both front and rear surfaces of the fastener tape so as to sandwich the fastener tape.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of major portions of a slide fastener with a separable bottom end stop;

FIG. 2 is a front view of major portions of a fastener stringer loaded with a box pin;

FIG. 3 is a bottom view of the fastener stringer;

FIG. 4 is a sectional view taken along line A-A (IV-IV) in FIG. 3;

FIG. 5 is an enlarged sectional view of a rib;

FIG. 6 is a front view of major portions of a fastener stringer loaded with an insert pin;

FIG. 7 is a bottom view of the same fastener stringer;

FIG. 8 is a sectional view of a box;

FIG. 9 is a sectional view taken along line B-B (IX-IX) in FIG. 8;

FIG. 10 is a partially broken front view of a state in which the box and the box pin are connected;

FIG. 11 is a partially broken front view showing a state in which the fastener stringer loaded with the insert pin is engaged with the fastener stringer loaded with the box;

FIG. 12 is a partially broken front view showing a state in which the fastener stringer loaded with the insert pin is engaged with the fastener stringer loaded with the box;

FIG. 13 is a front view of major portions showing a state

in which a fastener chain is sewed to a sewing object;

FIG. 14 is a sectional view taken along line C-C (XIV-XIV) in FIG. 13;

FIG. 15 is a front view of the separable bottom end stop showing a modification of the reinforcement portion;

FIG. 16 is a front view of the separable bottom end stop showing another modification of the reinforcement portion;

FIG. 17 is a partially broken front view of a bottom end stop in which the box and the box pin are integrated;

FIG. 18 is a front view showing a modification of the reinforcement portion loaded with the box pin;

FIG. 19 is a front view showing another modification of the reinforcement portion loaded with the box pin; and

FIG. 20 is a front view of major portions in another slide fastener with a separable bottom end stop.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, preferred embodiments of a slide fastener with a separable bottom end stop of the present invention will be described with reference to the drawings.

As shown in FIG. 1, in the slide fastener with the separable bottom end stop, a fastener chain 1 is not a closed product with a bottom stop end but an openable product, that is, provided with a separable bottom end stop 5 which enables right and left fastener stringers 2 to be separated completely.



Fastener elements 4 are mounted on a core portion 6 provided on the side edge of a fastener tape 3. A box pin 8 as the separable bottom end stop 5 is mounted on the core portion 6 continuously with the bottom end of the fastener element 4 of one side fastener stringer 2 and an insert pin 9 as the separable bottom end stop 5 is mounted on the core portion 6 continuously with the bottom end of the fastener element 4 of the other fastener stringer 2. As shown in FIG. 10, the fastener stringer 2 with the separable bottom end stop provided with the box pin 8 and a box 7 is produced and combined with the fastener stringer 2 loaded with the insert pin 9 so as to complete the slide fastener with the separable bottom end stop.

In the slide fastener with the separable bottom end stop according to a first embodiment shown in FIGS. 2 to 12, a flat reinforcement portion 10 is provided integrally with a side face of the box pin 8 attached to one side fastener stringer 2 of the fastener chain 1 such that it is exposed on the surface of the fastener tape 3 as shown in FIG. 2. On the other hand, a flat reinforcement portion 10 is provided integrally with a side face of the insert pin 9 attached to the other fastener stringer 2 such that it is exposed on the surface of the fastener tape 3 as shown in FIG. 6. The fastener elements 4, box pin 8, insert pin 9, box 7 and reinforcement portion 10 in the fastener chain 1 are formed integrally with the fastener tape 3 by injection molding means using thermoplastic resin such as polyacetal and

polyamide.

As shown in FIGS. 2, 3, 6 and 7, the box pin 8 and insert pin 9 are provided with the reinforcement portions 10 which are protruded outward from the side face thereof while the surfaces thereof are extended flatly. As shown in FIGS. 2 and 3, in the reinforcement portion 10 on the box pin 8, plural ribs 13 as an auxiliary member 11 are disposed obliquely such that they are protruded outward from the side face of a lower half of the box pin 8 on the fastener tape 3 and a concave portion 14 is formed among these ribs 13 disposed obliquely. The concave portion 14 is formed in various kinds of shapes, such as square, diamond, circle or oval and into a through-hole configuration. Consequently, the ribs 13 and the concave portion 14 are provided with flexibility and the intersecting portion of the ribs 13 is formed into an arc-like configuration such as circular one so as to scatter an external force applied to the reinforcement portion 10.

As for the size of the auxiliary member 11, the width of the fastener tape 3 in slide fasteners No. 3 to 5 often used usually is 13 to 16 mm and the size thereof is preferred to be within about 30% the width of this fastener tape 3. The size of the auxiliary member 11 can be changed freely depending on the size of the slide fastener or customer's demand. As the auxiliary member 11, the ribs 13 may be disposed in parallel in the width direction of the fastener tape 3 or it may be a

flat plate also, instead of the rib structure. Further, a cut-out 15, which is dented upward, is provided in the bottom edge of the auxiliary member 11 in the reinforcement portion 10 so as to absorb part of an external force with the cut-out 15 when a twisting force or the like is applied to the end portion of the fastener tape 3. In the meantime, the cut-out 15 may be provided in the top edge of the auxiliary member 11 also.

The ribs 13 are formed at a sewing position 40 for sewing onto a sewing object such as clothes in the outside portion of the reinforcement portion 10. In this rib 13, as shown in FIG. 2, plural ribs 13 are disposed in parallel in the width direction of the fastener tape 3 and the proximal ends of the ribs 13 are connected integrally to the auxiliary member 11. The front ends of the ribs 13 are extended up to the vicinity of the fastener tape 3 and the end portions of the respective ribs 13 are connected so as to form a frame 16. The rib 13 is formed thicker than the auxiliary member 11 as shown in FIG. 3.

The ribs 13 existing at the sewing position 40 indicate a substantially isosceles triangle having a pair of slopes as shown in FIGS. 4 and 5 and are protruded symmetrically from both the front and rear surfaces of the fastener tape 3. As for the specific configuration of the rib 13, the width W of a base portion 20 in contact with the fastener tape 3, that is, of the bottom portion is 0.6 to 0.9 mm and the height H thereof is in a range of 0.5 to 0.85 mm. The width of the rib 13 is expanded

gradually from a vertex 19 of the rib 13 up to the base portion 20 and an inclination angle  $\theta$  on the base portion 20 of the rib 13 is obtained based on the expression  $\tan\theta = H/(W/2)$  using the rib height H and width W. Accordingly, the inclination angle  $\theta$  is in a relation of  $1.1 \leq \tan\theta \leq 2.9$  and in a range of  $47^\circ$  to  $71^\circ$ . Preferably, the inclination angle  $\theta$  is in a range of  $55^\circ$  to  $70^\circ$ . The vertex 19 of the rib 13 is chamfered to form a chamfered portion 21 and preferably, this chamfered portion 21 is formed into a circular shape having a curvature radius of 0.05 to 0.1 mm in its sectional shape of the rib 13. The rib 13 having this configuration is capable of shifting the front tip of a sewing needle 41 to a slope 22 of the rib 13 easily even if the sewing needle 41 makes contact with the rib 13 when a sewing line is formed with the sewing machine, thereby preventing the rib 13 from being damaged. Further, the slope 22 may be curved into a slight arc-like configuration instead of a flat face.

Because the ribs 13 are formed symmetrically on both the front and rear surfaces of the fastener tape 3 at the sewing position 40 as shown in FIG. 4, the ribs 13 are protected from a damage due to a strike of the sewing needle 41 even if sewing operation is carried out from any side. At the sewing position 40, gap portions 23 are provided between adjacent ribs 13 in the length direction of the fastener tape 3 so as to facilitate sewing of the reinforcement portion 10. The gap S is measured

between the base portions 20 of the ribs 13 and the size S of the gap portion 23 is recommended to be 2.0 to 2.5 mm. When the fastener tape 3 is sewed to the sewing object 42, the size d of the sewing needle 41 for use is 0.92 to 1.02 mm. If it is considered that the sewing needle 41 is pierced into the fastener tape 3 in the interval S between the ribs 13, the sewing needle 41 is prevented from contacting the rib 13 because the interval S is larger than the width W of the bottom portion of the rib 13 and the size d of the sewing needle 41, so that the reinforcement portion 10 can be sewed securely.

As for the configuration of the box pin 8 formed on the core portion 6 of the fastener tape 3, a recess 17 is provided on an opposite face to the face on which the reinforcement portion 10 is formed. A partition plate 29 provided between a front wall 25 and a rear wall 26 of the box 7 is engaged with this recess 17 so as to integrate the box pin 8 with the box 7.

In the reinforcement portion 10 of the fastener stringer 2 loaded with the insert pin 9, as shown in FIGS. 6 and 7, plural ribs 13 are disposed obliquely as the auxiliary members 11 such that they are protruded outward on the side face in the lower half portion of the insert pin 9, that is, the fastener tape 3 like the fastener stringer 2 loaded with the box pin 8. Through-hole type concave portions 14 having no bottom portion are formed among these oblique ribs 13 so as to provide with

flexibility. Intersecting portions of the ribs 13 are formed in an arc-like shape such as circular one so as to scatter an external force applied to the reinforcement portion 10.

The auxiliary member 11 in the reinforcement portion 10 is formed within about 30% of the width of the fastener tape 3 like the fastener stringer 2 loaded with the box pin 8. The cut-out 15 is provided in the lower edge of the auxiliary member 11 in the reinforcement portion 10 so as to absorb part of an external force such as a twisting force applied to the end portion of the fastener tape 3 through the cut-out 15. In the meantime, the cut-out 15 may be provided on the upper edge of the auxiliary member 11.

The ribs 13 are formed outside the reinforcement portion 10 such that it is connected to auxiliary member 11 like the fastener stringer 2 loaded with the box pin 8. This rib 13 is formed into a rib 13 thicker than the rib 13 in the auxiliary member 11 and these ribs 13 are provided such that they are extended in parallel with an interval toward the outside of the fastener tape 3 and the front ends of the ribs 13 are connected to form the frame 16.

The ribs 13 indicate a substantially isosceles triangle having a pair of slopes like the rib 13 of the fastener stringer 2 loaded with the box pin 8 shown in FIG. 5. The width W of the base portion 20 of the rib 13 or its bottom portion is 0.6 to 0.9 mm and the height H is in a range of 0.5 to 0.85 mm. The

width of the rib 13 is expanded gradually from the vertex 19 of the rib 13 up to the base portion 20. An inclination angle  $\theta$  on the base portion 20 of the rib 13 in a relation of  $1.1 \leq \tan\theta \leq 2.9$  and in a range of  $47^\circ$  to  $71^\circ$ . Preferably, the inclination angle  $\theta$  is in a range of  $55^\circ$  to  $70^\circ$ . The vertex 19 of the rib 13 is chamfered to form the chamfered portion 21 and preferably, this chamfered portion 21 is formed into a circular shape having a curvature radius of 0.05 to 0.1 mm in its sectional shape of the rib 13. The rib 13 shifts the front tip of the sewing needle 41 to the slope 22 of the rib 13 easily even if the sewing needle 41 makes contact with the rib 13 when a sewing line is formed with the sewing machine, thereby preventing the rib 13 from being damaged. Further, the surface of the slope 22 may be slightly curved instead of a flat surface.

The reinforcement portion 10 constituted of the auxiliary member 11 formed in the fastener stringer 2 loaded with the box pin 8 and insert pin 9 and the reinforcement portion 10 formed of the ribs 13 at the sewing position 40 adjacent the auxiliary member 11 are formed on the front and rear surfaces of the fastener tape 3 by injection molding as shown in FIGS. 3 and 7, so that the front and rear faces of the fastener tape 3 are sandwiched by the reinforcement portions 10. The reinforcement portions 10 may be formed on only a single face of the fastener tape 3, not on both sides.

In the box 7 to be attached to the fastener stringer 2

loaded with the box pin 8, which is a rectangular solid, as shown in FIGS. 8 and 9, a thin partition plate 29 is provided at an upper portion in the center between the front wall 25 and the rear wall 26 and an engaging portion 32 is provided on the bottom end of the partition plate 29. An insertion hole 28 which is an opening equal to the thickness of the auxiliary member 11 of the reinforcement portion 10 and through which the fastener stringer 2 loaded with the box pin 8 can be inserted, is provided in the rear wall 27 located midway of the box 7 while a box pin insertion hole 30 through which the box pin 8 can be inserted is provided between the insertion hole 28 and the partition plate 29. An insertion hole 28, which is an opening equal to the thickness of the auxiliary member 11 of the reinforcement portion 10 and through which the fastener stringer 2 loaded with the insert pin 9 can be inserted, is provided up to the bottom portion while an insert pin insertion hole 31 through which the insert pin 9 can be inserted is provided between the insertion hole 28 and the partition plate 29, so that the box 7 is completed.

As shown in FIG. 10, the box pin 8 of the fastener stringer 2 loaded with the box pin 8 is inserted into the box pin insertion hole 30 in the box 7 and the auxiliary member 11 of the reinforcement portion 10 is inserted into the insertion hole 28 in the side wall 27 and the partition plate 29 provided in the box 7 is pressed into the recess 17 provided in the side



face of the box pin 8. As a result, the engaging portion 32 provided on the bottom end of the partition plate 29 engages an end of the recess 17, thereby the box pin 8 and the box 7 being integrated with each other and fixed.

When the fastener stringer 2 loaded with the insert pin 9 is mounted on the fastener stringer 2 loaded with the box 7, with a slider 35 being slid to contact the top end of the box 7 and held in contact therewith as shown in FIG. 11, the insert pin 9 is inserted into a guide groove 37 in the slider 35 by nipping the reinforcement portion 10 of the fastener stringer 2 loaded with the insert pin 9. Further, the auxiliary member 11 of the reinforcement portion 10 is inserted between the flanges 36 so that the insert pin 9 is inserted into the insert pin insertion hole 31 in the box 7. After that, if the slider 35 is pulled and slid by nipping the reinforcement portion 10, the fastener chain 1 in which the fastener elements 4 on the right and left fastener stringers 2 engage each other is completed as shown in FIG. 12.

When the completed fastener chain 1 is mounted on an object fabric 42 such as clothes, the object fabric 42 is fit to the sewing position 40 in the reinforcement portion 10 provided integrally with the box pin 8 and insert pin 9 formed on the right and left fastener stringers 2 as shown in FIGS. 13 and 14, the object fabric 42 and the fastener tape 3 are sewed together by a sewing machine such that a sewing thread rides

over the rib 13.

In the reinforcement portion 10 shown in FIG. 15, the auxiliary member 11, which are disposed on the side face of the box pin 8 in parallel in the width direction of the fastener tape 3, is provided integrally with the ribs 13. The ribs 13 at the sewing position 40 or the ribs 13 having the same configuration as the ribs 13 shown in FIGS. 4 and 5 are disposed at a predetermined gap portion 23 such that they are continuous from the auxiliary member 11. Like the box pin 8, the auxiliary member 11 arranged in the width direction of the fastener tape is provided integrally with the ribs 13 and the ribs 13 at the sewing position 40 are disposed at the predetermined gap portion 23 such that they are continuous from the auxiliary member 11.

The reinforcement portion 10 shown in FIG. 16 has plural ribs 13 extended toward the outside of the fastener tape 3 such that they are curved. The ribs 13 having the same shape as the ribs 13 having the condition shown in FIGS. 4 and 5 are extended from the side face of the box pin 8 with the predetermined gap portion 23 up to the side edge of the fastener tape 3 such that they are curved together in parallel. The ribs 13 having the same shape are formed on the side face of the insert pin 9 with the predetermined gap portion 23 and the reinforcement portion 10 of this type is suitable for a small size of the fastener tape 3. In the meantime, the ribs 13 may be connected to the auxiliary member 11 provided on the side face of the box pin

8 and insert pin 9.

In the reinforcement portion 10 shown in FIG. 17, the box pin 8 and box 7 are formed integrally and the connection side of the auxiliary member 11 of the reinforcement portion 10 is formed integrally with the box 7, so that they are connected and fixed firmly. In the reinforcement portion 10 shown in FIG. 18, the auxiliary member 11 constituted of oblique ribs 13 is provided integrally with the side face of the box pin 8 and in this auxiliary member 11, the ribs 13 are arranged with the predetermined gap portion 23 like the previous example such that outside of the ribs 13 is open. In the reinforcement portion 10 shown in FIG. 19, the auxiliary members 11 are provided on both the surfaces of the fastener tape 3 so that they are extended from the side face of the box pin 8 and this auxiliary member 11 is provided with the rib 13 which is formed on a single face of the fastener tape 3 at the sewing position 40. It is permissible to pull out a warp yarn (not shown) from the fastener tape located at the outer edge of the rib disposed at the sewing position so as to form a rough structure portion and then, allow a melted synthetic resin material to penetrate into the rough structure when the outer portion of the rib is molded on the rough structure portion so as to fix the ribs to the fastener tape strongly.

The embodiment shown in FIG. 20 shows an example applied to a double side openable type separable bottom end stop 5. An

end of one fastener stringer 2 is loaded with the box pin 8 and an end of the other fastener stringer 2 is loaded with the insert pin 9. The right and left fastener stringers 2 have no box 7 and two sliders 35 are mounted slidably in opposite directions so that the fastener chain 1 is opened/closed from both sides and can be separated to the right and left sides.

The relatively long box pin 8 which two sliders 35 can pass is formed on the core portion 6 of one fastener tape 3 in this slider fastener. A flange 36 of the slider 35 makes contact with the front end of this box pin 8 and a stopper 18 for stopping the sliding of the slider 35 is formed such that it is extended horizontally. A front end of the stopper 18 is extended up to the thick rib 13 formed at the sewing portion 40 in the reinforcement portion 10. A thin protruded piece 33 which is protruded sideways is provided on the top end of the box pin 8 in step like configuration, so that it is capable of overlapping the step-like protruded piece 33 provided on the top end of the insert pin 9.

The relatively long insert pin 9 which the two sliders 35 can pass is formed on the core portion 6 of the other fastener tape 3. The protruded piece 33 which coincides with the protruded piece 33 of the box pin 8 and overlap the protruded piece 33 is provided on the top end of the insert pin 9. The auxiliary member 11, 11 of the reinforcement portions 10, 10 are formed such that its end side is expanded so as to coincide

with a blade of the slider 35 in order to allow the wide blades on the shoulder side of the slider 35 to pass.

As for the usage condition of the separable bottom end stop 5, with two sliders 35 mounted on the fastener stringer 2 loaded with the box pin 8 such that they are directed in opposite directions, the slider 35 is kept in contact with the stopper 18 of the box pin 8, the insert pin 9 of the fastener stringer 2 loaded with the insert pin 9 is inserted. Then, the slider 35 located upper is pulled upward so as to engage the fastener elements 4 on the right and left fastener stringers 2 with each other, thereby completing the fastener chain 1. To separate the fastener chain 1, if the fastener stringer 2 loaded with the insert pin 9 is pulled out of the two sliders 35 after those two sliders 35 are pulled down to the stopper 18, the right and left fastener stringer 2 can be disconnected and released.

The slide fastener with the separable bottom end stop has the above-described configuration and with this configuration, following effects are exerted.

That is, fastener elements are attached to opposing side edges of a pair of fastener tapes and there are provided a separable bottom end stop made of synthetic resin which is attached by integral molding to the side edge of the fastener tape at an end portion of the fastener elements, and a reinforcement portion provided integrally with the separable bottom end stop such that they are exposed on at least one face

of the fastener tape. The reinforcement portion is formed of plural ribs connected to the separable bottom end stop. The ribs are formed at the sewing position such that its height  $H$  is 0.5 to 0.85 mm and its width  $W$  is 0.6 to 0.9 mm and that it is expanded gradually from its vertex to the base portion. There is provided a gap portion wider than the base portion of the rib between the ribs. Accordingly, the configuration of the rib at the sewing position in the reinforcement portion is specified and consequently, when the reinforcement portion is sewed to a sewing object, the rib can avoid strike of the sewing needle easily. As a result, the ribs are prevented from being damaged and using the gap portion, the reinforcement portion can be sewed accurately and firmly.

In addition to the above-described structure, the ribs at the sewing position in the reinforcement portion is provided with the chamfered portion by chamfering the vertex thereof and the chamfered portion is formed into an arc-like configuration having a radius of 0.05 to 0.1 mm in its lateral section. Accordingly, the ribs can shift the front tip of a sewing needle smoothly when the reinforcement portion is sewed to a sewing object so as to prevent damage of the ribs. Further, because the size  $S$  of the gap portion between adjacent ribs at the sewing position in the reinforcement portion is 2.0 to 2.5 mm and the ribs are disposed in parallel in the width direction, the ribs located at the sewing position in the reinforcement portion can

be sewed easily and the reinforcement portion can be fixed firmly to the sewing object using the gap portion effectively.

Regarding the ribs at the sewing position in the reinforcement portion, the degree of an inclination of the rib at its base portion is indicated by  $\tan\theta = H/(W/2)$  while the  $\tan\theta$  satisfies  $1.1 \leq \tan\theta \leq 2.9$  and the inclination angle of the rib at the base portion is set in a range of  $55^\circ$  to  $70^\circ$ . Accordingly, the sewing needle is shifted away effectively by the slope of the rib inclined at such a specific angle when the ribs located at the sewing position in the reinforcement portion is sewed, so that they can be sewed effectively.

Because the ribs at the sewing position in the reinforcement portion are disposed on the side face of the separable bottom end stop through the auxiliary member, they are optimum reinforcement portion for a large size slide fastener and can be sewed to the sewing object effectively. Further, because the ribs at the sewing position in the reinforcement portion are disposed directly on the side face of the separable bottom end stop, they are optimum reinforcement portions for a small size slide fastener and they can be sewed to the sewing object effectively.

Further, because the ribs at the sewing position in the reinforcement portion are disposed symmetrically on both the front and rear surfaces of the fastener tape, the ribs avoid strike of the sewing needle securely even if the fastener tape

is sewed from any side, so that the fastener tape can be sewed smoothly and strongly, thereby producing an excellent quality product. Thus, the effects produced by the present invention are very remarkable.